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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/677,395 | 10/01/2003 | Sonia E. Letant | IL-11138 | 8871 |

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| EXAMINER | |
|---|---|
| CROW, ROBERT THOMAS | |
| **ART UNIT** | **PAPER NUMBER** |
| 1634 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 02/16/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/677,395 | LETANT ET AL. | |
| | Examiner | Art Unit | |
| | Robert T. Crow | 1634 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *13 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-9* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☒ Interview Summary (PTO-413) Paper No(s)/Mail Date. *2/2007*.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## FINAL ACTION

### *Status of the Claims*

1. This action is in response to papers filed 13 November 2006 in which the specification and claims 1, 6, 7, and 9 were amended, no claims were canceled, and no new claims were added. All of the amendments have been thoroughly reviewed and entered.

The interview summary is acknowledged and the interview record is complete.

The previous objections to the specification in the previous Office Action are withdrawn in view of the amendments.

The previous rejections under 35 U.S.C. 112, second paragraph, are withdrawn in view of the amendments.

The previous rejections under 35 U.S.C. 102(a,b,e) and 35 U.S.C. 103(a) not reiterated below are withdrawn in view of the amendments. Applicant's arguments have been thoroughly reviewed and are addressed following the rejections necessitated by the amendments.

The previous rejections under the judicially created doctrine of obviousness-type double patenting are withdrawn in view of Applicant's filing of the Terminal Disclaimers, which were **approved** on 14 February 2007.

Claims 1-9 are under prosecution.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-2, and 7-8 are rejected under 35 U.S.C. 102(b) as being anticipated by Beattie (U.S. Patent No. 5,843,767, issued 1 December 1998).

Regarding claim 1, Beattie teaches an apparatus. In a single exemplary embodiment, Beattie teaches a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figures 1a and 4. Beattie also teaches cross-linkers attached to an inner wall of said aperture in the form of epoxysilane-amine linkages that are provided to attach biopolymers (column 13, lines 45-50), and a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said aperture, attached at or near the circumference of one end of the cylindrical portion of said aperture; namely, a polymeric layer containing an array of orifices is aligned with an array of nanochannels (column 10, lines 34-44), wherein the layers are bound with an adhesive (column 10, lines 60-67). The adhesive is ablated to produce a hole, which is a ring with an inner diameter that allows flow from the sample well and nanopores (column 11, lines 32-38).

Regarding claim 2, Beattie teaches the apparatus of claim 1, wherein the substrate is made from glass (Example I).

Regarding claim 7, Beattie teaches an apparatus. In a single exemplary embodiment, Beattie teaches a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figures 1a and 4. Beattie also teaches cross-linkers attached to an inner wall of said aperture in the form of epoxysilane-amine linkages are provided to attach biopolymers (column 13, lines 45-50), and antibodies or chemical functional groups deposited around the inner walls of the aperture or around the circumference of one end of said aperture; namely, amine containing biopolymers are attached to the walls (column 13, lines 45-50). The biopolymers are antibodies (column 7, lines 20-21).

Regarding claim 8, Beattie teaches the apparatus of claim 7, wherein the substrate is made from glass (Example I).

4. Claims 1, 2, 4, 5, 7, and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Akeson et al (Biophys. J. vol. 77, pp. 3227-3233 (1999)).

Regarding claim 1, Akeson et al teach an apparatus . In a single exemplary embodiment, Akeson et al teach a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal in diameter to said bottom diameter of said tapered portion; namely, Figure 1, wherein the cylindrical portion is the part of the figure wherein the lipid bilayer is shown. Akeson et al also teach cross-linkers attached to an inner wall of said aperture in the form of the lipid bilayer in the aperture (Figure 1), and a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said aperture, attached at or near the circumference of one end of the cylindrical portion of said aperture; namely, one α-hemolysin channel is inserted in the bilayer (Figure 1).

Regarding claim 2, Akeson et al teach the apparatus of claim 1, wherein the substrate is polymeric materials; namely, Teflon (caption of Figure 1).

Regarding claim 4, Akeson et al teach the apparatus of claim 1, wherein a chemical or biological probe is attached to the macro-cyclic ring such that the biological or chemical probe extends into and rests between at least a portion of the surfaces of the inner walls of the cylindrical portion of said aperture; namely, Figure 1, which shows a nucleic acid trapped in the pore.

Regarding claim 5, Akeson et al teach the apparatus of claim 4, wherein the biological probe comprises a single strand sequence of DNA; namely, the device is used with poly dC (Figures 1 and 4)

Regarding claim 7, Akeson et al teach an apparatus. In a single exemplary embodiment, Akeson et al teach a substrate having at least one aperture having a tapered portion with a top diameter greater

than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal in diameter to said bottom diameter of said tapered portion; namely, Figure 1, wherein the cylindrical portion is the part of the figure wherein the lipid bilayer is shown. Akeson et al further teach cross-linkers attached to an inner wall of said aperture in the form of the lipid bilayer in the aperture (Figure 1)a and chemical functional groups deposited around the inner walls of the aperture or around the circumference of one end of said aperture; namely, one α-hemolysin channel is inserted in the bilayer (Figure 1).

Regarding claim 8, Akeson et al teach the apparatus of claim 7, wherein the substrate is polymeric materials; namely, Teflon (caption of Figure 1).

*Claim Rejections - 35 USC § 103*

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beattie (U.S. Patent No. 5,843,767, issued 1 December 1998) in view of Hoger (J. Polymer Sci. Part A; Poly. Chem., vol. 37, pp.2685-2698 (1999)).

Regarding claim 3, Beattie teaches the apparatus of claim 1. In a single exemplary embodiment, Beattie teaches a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figures 1a and 4. Beattie also teaches cross-linkers attached to an inner wall of said aperture in the form of epoxysilane-amine linkages that are provided to attach biopolymers (column 13, lines 45-50), and a macro-cyclic ring, having a diameter substantially the same as the diameter of the cylindrical portion of said aperture, attached at or near the circumference of one end of the cylindrical portion of said aperture; namely, a polymeric layer containing an array of orifices is aligned with an array of nanochannels (column 10, lines 34-44), wherein the layers are bound with an adhesive (column 10, lines 60-67). The adhesive is ablated to produce a hole, which is a ring with an inner diameter that allows flow from the sample well and nanopores (column 11, lines 32-38).

While Beattie teaches a macrocyclic ring in the form of an adhesive (column 10, lines 60-67) that is ablated to produce a hole, which is a ring with an inner diameter that allows flow from the sample well and nanopores (column 11, lines 32-38), Beattie does not teach rigid phenylethynyl backbones.

However, Hoger et al teach macro-cyclic rings comprising rigid phenylethynyl backbones (Abstract) with the added benefit that they are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the method as taught by Beattie with the macro-cyclic ring as taught by Hoger et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted an apparatus

having host molecules therein that recognize guest molecules by precise complementarity as explicitly taught by Hoger et al (page 2687, column 2, lines 19-25).

8. Claims 1, 6, 7, and 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Beattie (U.S. Patent No. 5,843,767, issued 1 December 1998) in view of Letant et al (Nature Materials, vol. 2 pp. 391-395 (June, 2003)).

Regarding claims 6 and 9, Beattie teaches the apparatus of claims 1 and 7. In a single exemplary embodiment, Beattie teaches a substrate having at least one aperture having a tapered portion with a top diameter greater than a bottom diameter and wherein the tapered portion of the aperture transitions into a cylindrical portion having a diameter equal to said bottom diameter of said tapered portion; namely, Figures 1a and 4. Beattie also teaches cross-linkers attached to an inner wall of said aperture in the form of epoxysilane-amine linkages are provided to attach biopolymers (column 13, lines 45-50), and antibodies or chemical functional groups deposited around the inner walls of the aperture or around the circumference of one end of said aperture; namely, amine containing biopolymers are attached to the walls (column 13, lines 45-50). The biopolymers are antibodies (column 7, lines 20-21).

While Beattie et al also teach porous silicon wafers (column 9, lines 17-19), Beattie et al are silent on Silicon Nitride, a Silicon On Insulator (SOI) wafer, and a layer of Silicon Nitride.

However, Letant et al teach porous silicon membranes (Abstract) having a substrate comprising Silicon Nitride, a Silicon On Insulator (SOI) wafer, and a layer of Silicon Nitride (page 394, column 2, paragraphs 2 and 3) with the added benefit that the silicon nitride top and bottom masks prevent derivatization of the remainder of the substrate, thereby preventing unwanted binding on the top and bottom surface (page 394, column 2, paragraph 3).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the apparatus as taught by Beattie with the substrate as taught by Letant et al with a reasonable expectation of success. The ordinary artisan would have been motivated

to make such a modification because said modification would have resulted in an apparatus that prevents derivatization of the remainder of the substrate, thereby preventing unwanted binding on the top and bottom surface, as explicitly taught by Letant et al (page 394, column 2, paragraph 3).

*Response to Arguments*

9. Applicant's arguments filed 13 November 2006 have been fully considered but they are not persuasive for the reason(s) listed below.

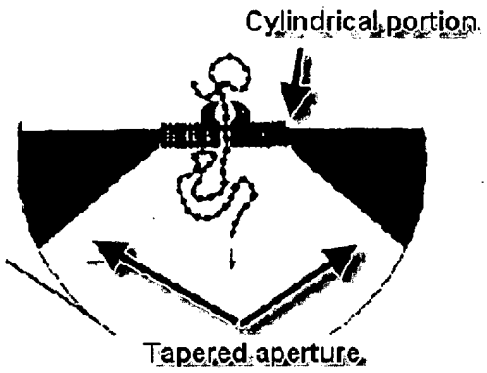
A. While Applicant acknowledges on page 10 of the Remarks that Beattie does teach that the wells taper to a cylindrical portion, wherein the cylindrical portion contains a multiplicity of submicron diameter channels, they also argue on page 10 of the Remarks that the cylindrical portion of Beattie does not have a diameter equal to the bottom diameter of a tapered portion.

It is noted that the specification does not provide any limiting definition of what constitutes a "cylindrical portion." Thus, the cylindrical portion of the substrate of Beattie et al comprises entire area that contains the submicron diameter channels. The "cylindrical portion" containing the submicron channels is of the same diameter as the bottom of the tapered portion . Thus, the claim has been given the broadest reasonable interpretation consistent with the specification (*In re Hyatt*, 211 F.3d1367, 1372, 54 USPQ2d 1664, 1667 (Fed. Cir. 2000) (see MPEP 2111 [R-1]) and is anticipated by Beattie.

B. Applicant argues on pages 11-12 of the Remarks that Akeson et al do not teach an tapered aperture or a macrocyclic ring.

However, Figure 1 of Akeson et al specifically depicts a conical aperture in a Teflon substrate (caption of Figure 1), which is the tapered aperture, that has a small flat cylindrical portion where the bilayer is placed (see below). The flat cylindrical portion is the pore and is part of the Teflon substrate. The lipid bilayer comprises the crosslinkers, and the macrocyclic ring I having substantially the same diameter as the cylindrical portion is the a-hemolysin chain.

It is noted that while Applicant argues on page 12 of the Remarks that "a macro-cyclic ring can generally be described and as organic compound (emphasis added by examiner)," the definition is neither limiting nor found in the specification. Thus, while Applicant presents a viable interpretation of the teachings of Akeson, the examiner's interpretation is equally viable, and is consistent with the




teachings of the specification. Thus, the claim has been given the broadest reasonable interpretation consistent with the specification and is anticipated by Beattie.

C. Applicant's arguments on pages 13-15 of the Remarks with respect to the teachings of Letant et al have been fully considered and are persuasive. The rejection of claims 1- and 7-8 under 35 USC 102 (a,e) has been **withdrawn**.

D. In response to Applicant's argument on pages 16-17 of the Remarks that the properties of the macrocyclic ring of Hoger et al is not what is disclosed in Applicant's invention, the fact that applicant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985).

E. In response to Applicant's arguments on pages 18-19 of the Remarks that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any

judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

F. Applicant argues on page 19 of the Remarks that the examiner has not shown a reasonable likelihood of success and that the modification would not result in the claimed structure.

However, as stated above, Beattie teaches a macrocyclic ring in the form of an adhesive (column 10, lines 60-67) that is ablated to produce a hole, which is a ring with an inner diameter that allows flow from the sample well and nanopores (column 11, lines 32-38), Beattie does not teach rigid phenylethynyl backbones. Hoger et al teach macro-cyclic rings comprising rigid phenylethynyl backbones (Abstract) with the added benefit that they are host molecules that recognize guest molecules by precise complementarity (page 2687, column 2, lines 19-25).

It would therefore have been obvious to a person of ordinary skill in the art at the time the invention was claimed to have modified the method as taught by Beattie with the macro-cyclic ring as taught by Hoger et al with a reasonable expectation of success. The ordinary artisan would have been motivated to make such a modification because said modification would have resulted an apparatus having host molecules therein that recognize guest molecules by precise complementarity as explicitly taught by Hoger et al (page 2687, column 2, lines 19-25). Thus, teaching, motivation, and a reasonable expectation of success have been demonstrated, and the claims are obvious over the teachings of Beattie in view of Hoger et al.

G. The remaining arguments regarding the dependent claims rely on arguments set forth to address the rejections of independent claims 1 and 7 under 35 USC 102(b). Since the arguments regarding independent claims 1 and 7 were not persuasive, the rejections of the dependent claims are maintained.

*Conclusion*

10. No claim is allowed.

11. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

12. A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Robert T. Crow whose telephone number is (571) 272-1113. The examiner can normally be reached on Monday through Friday from 8:00 am to 4:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ram Shukla can be reached on (571) 272-0735. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Robert T. Crow
Examiner
Art Unit 1634

RAM R. SHUKLA, PH.D.
SUPERVISORY PATENT EXAMINER